PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2001-105084
(43)Date of publication of application : 17.04.2001

(51)Int.Cl. B21J 5/06
B21J 5/00
B21J 5/10
B21J 13/02
B21K 1/14

(21)Application number : 11-282278
(22)Date of filing : 04.10.1999

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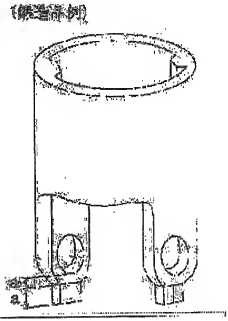
(54) METHOD FOR PRODUCING FORGED PRODUCT HAVING THROUGH- HOLE

(57)Abstract:
PROBLEM TO BE SOLVED: To provide a method of producing a forged product having a through- hole in a direction almost orthogonal to the pressurized direction.
SOLUTION: A through-hole forming pin is slidably arranged in a die cavity and an excess metal forming gap is arranged at the downstream side of a metal flow relative to the forming pin and impurity inclusion on a metal joining surface developed when the through-hole is formed is removed into this excess metal forming gap.



LEGAL STATUS

[Date of request for examination]

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

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CLAIMS

[Claim(s)]

[Claim 1] In the front of a product or the back of having the through tube of the direction of an abbreviation right angle to the pressurization direction, or cross-direction combined extrusion forging A material is thrown in in the Shimokane mold cavity who arranged the through tube formation pin possible [sliding], and prepared excess metal shaping spare time in the metal flow lower stream of a river to the through tube formation pin concerned. The manufacture approach of the forging which carries out [mold clamp] with the upper metal mold which arranged punch, and is characterized by fabricating a forging, pulling out a through tube formation pin out of a cavity after that, and paying out the forging concerned in knock out pin.
[Claim 2] The manufacture approach of a forging according to claim 1 forged at 350-450 degrees C using an aluminium alloy.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to York which transmit especially turning effort, and manufacture of a bearing etc. about the manufacture approach of a forging.

[0002]

[Description of the Prior Art] In the case of the forging which has a through tube in an extrusion metal flow and the direction of an abbreviation right angle in extrusion forging, processing which fabricates in the condition that there is no through tube, and obtains a through tube by machining behind is carried out first.

[0003] For example, the joint section installation hole of York was obtained by machining the piece of the York lug with a drill etc. after shaping by forging.

[0004] It is because [since the metal flow would be divided once and will join again by a core etc., when the core etc. tended to be prepared in the cavity and it was going to fabricate the through tube as the reason for technical] it is placed between planes of composition by the oxide etc. and sufficient bonding strength is not obtained.

[0005]

[Problem(s) to be Solved by the Invention] The technical problem which this invention tends to solve is in offer of the forging approach by which sufficient reinforcement and dependability are acquired also in the joint of a metal flow in manufacture of the forging which has a through tube in the pressurization direction and the direction of an abbreviation right angle of forging shaping.

[0006]

[Means for Solving the Problem] The means provided in order that this invention might solve the above-mentioned technical problem should prepare excess metal shaping spare time in the metal flow lower stream of a river to the through tube formation pin concerned, and should add a part for excess metal formation of optimum dose for the material input to the predetermined forging while it prepared the through tube formation pin for forming a through tube in a forging possible [sliding] in the cavity.

[0007] If a through tube formation pin is hit, a metal flow will be divided, if it pressurizes by the punch which threw in the material in the cavity when hereafter explained in order of the production process, and was attached in upper metal mold, a material will deform according to a cavity configuration, material metal flows so that the through tube formation pin concerned may be wrapped in, if pressurization progresses further, and a plane of composition is formed.

[0008] Although it will be placed between planes of composition by the oxide film produced on the surface of the material after ending forging shaping in this condition, in this invention, pressurization is continued further and a metal flow is carried out to the excess metal shaping spare time prepared in the Shimokane mold.

[0009] By this, the inclusion of the above-mentioned plane of composition will be formed in an excess metal part. The target forging will be obtained by picking out a forging for a through tube formation pin from metal mold in sliding out of a cavity, and sampling knock out pin, and removing an excess metal part with a press etc. after that.

[0010] Here, although the magnitude of an excess metal part will be suitably set up according to a product configuration, in the case of the example shown in drawing 2 , it is desirable [magnitude] to prepare excess metal die-length a more than [from the product edge of the piece of the York lug to a through tube edge] dimension a0.

[0011] Moreover, when adopting an aluminium alloy as a forging material, 350-450 degrees C is good in molding temperature, and 380-420 degrees C is good desirably.

[0012] It is because there is a possibility that the oxide film of an aluminum material front face may become thick, destruction in a plane of composition and removal may become difficult, and the reinforcement of a through tube may fall, at less than 350 degrees C when a moldability worsens and exceeds 450 degrees C.

[0013] Moreover, it is better to lessen as much as possible, although the lubricant coverage to a material is also selected suitably.

[0014]

[Embodiment of the Invention] The gestalt of operation of this invention is explained below based on an accompanying drawing.

[0015] Although the mimatic diagram of metal mold is shown in drawing 1 , a cavity 6 is formed in the Shimokane mold 2, and the through tube formation pins 51 and 52 are connected with the mechanical

component 8 possible [sliding].
[0016] Moreover, the excess metal shaping spare time 7 and knock out pin 8 are arranged by the cavity lower part.
[0017] On the other hand, punch 3 is formed in the upper metal mold 1. The aluminium alloy material 4 was thrown in in the cavity. upper metal mold was dropped, and forging shaping was carried out by punch.
[0018] Although the example of a configuration of the forging in this operation gestalt was shown in drawing 2 , since it was joint dia-length d0=4.5mm, it was set as excess metal dia length of a= 4.5mm or more. the excess metal thickness of 3mm, and excess metal width of face of 6mm.
[0019] After that, the mechanical component was operated, the through tube formation pin was pulled out from the product section, knock out pin was raised, and the product was taken out.
[0020] The result of having carried out on-the-strength evaluation of the obtained product on the following conditions is shown in drawing 3 .
[0021] The drum section of the forging in a [cast-method] book operation gestalt was fixed. the pin penetrated to both pores was inserted, the pin was rotated in the excess metal shaping direction and the direction of an abbreviation right angle, and it asked for the breaking strength of a joint.
[0022] Cutting removal of the excess metal section was carried out after [condition] T6 processing, and it examined by setting the greatest measured value as 500 N-m more than to target on-the-strength 450N-m.
[0023] In addition, when changing molding temperature and excess metal die length for a comparison, it was similarly shown in drawing 3 .
[0024]
[Effect of the Invention] While according to this invention being able to remove inclusion, such as an oxide of the plane of composition of a metal flow, and lubricant, also in the case of the forging which has a through tube in the direction of an abbreviation right angle to the pressurization direction, being able to obtain the forging excellent in reinforcement and dependability and being able to omit machining of a pore like before, it can contribute to reduction of the cost of materials.

[Translation done.]

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] The mimetic diagram of the metal mold in this invention is shown.

[Drawing 2] The example of a configuration of the product obtained in this invention is shown.

[Drawing 3] The result of a forging pore on the strength is shown.

[Translation done.]

(19)日本国特許庁（ＪＰ）　(12) 公開特許公報（Ａ）　(11)特許出願公開番号

特開2001－105084

（P2001－105084A）

(43)公開日　平成13年4月17日(2001.4.17)

(51)Int.Cl.⁷	識別記号	F I	テーマコード゛(参考)
Ｂ２１Ｊ　5/08		Ｂ２１Ｊ　5/08	Ａ　４Ｅ０８７
5/00		5/00	Ｄ
5/10		5/10	Ｚ
13/02		13/02	Ｈ
Ｂ２１Ｋ　1/14		Ｂ２１Ｋ　1/14	Ｚ

審査請求　未請求　請求項の数２　ＯＬ　（全　３　頁）

(21)出願番号　特願平11－282278

(22)出願日　平成11年10月4日(1999.10.4)

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Ｆターム(参考)　4E087 BA04 CA22 CA24 CA25 CA28 CB01 CB04 HA28 HA41

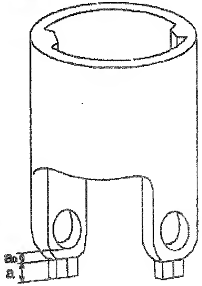
(54)【発明の名称】　貫通孔を有する鍛造品の製造方法

(57)【要約】

【目的】加圧方向に対して略直角方向に貫通孔を有する鍛造品の製造方法の提供。

【解決手段】金型キャビティ内に摺動可能に貫通孔形成ピンを設け、該形成ピンに対してメタルフローの下流に余肉成形隙を設け、貫通孔成形時に生じたメタル接合面の不純物介在物を該余肉成形隙に除去する。

（鍛造品例）



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【特許請求の範囲】

【請求項１】　加圧方向に対して略直角方向の貫通孔を有する製品の前方または後方、あるいは前後方向斜め押出鍛造において、貫通孔形成ピンを摺動可能に配設し、かつ、当該貫通孔形成ピンに対してメタルフロー下流に余肉成形隙を設けた下金型キャビティ内に素材を投入し、パンチを配設した上金型にて型締めして鍛造品を成形し、その後に貫通孔形成ピンをキャビティ内から抜き、ノックアウトピンにて当該鍛造品を払い出すことを特徴とする鍛造品の製造方法。

【請求項２】　アルミニウム合金を用いて、３５０～４５０℃にて鍛造する、請求項１記載の鍛造品の製造方法。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】本発明は、鍛造品の製造方法に関するものであり、特に回転力を伝達するヨーク類や、軸受け等の製造に係るものである。

【０００２】

【従来の技術】押出鍛造にて押出メタルフローと略直角方向に貫通孔を有する鍛造品の場合には、まず、貫通孔のない状態にて成形し、後に機械加工にて貫通孔を得る加工をしている。

【０００３】例えば、ヨークのジョイント部取り付け孔は、ヨーク耳片を鍛造にて成形後にドリル等にて機械加工することで得られていた。

【０００４】その技術的理由としては、キャビティ内に中子等を設けて貫通孔を成形しようとすると、メタルフローが中子等で一度分断され、再度接合することになるので、接合面に酸化物等が介在して、充分な接合強度が得られないとされていたからである。

【０００５】

【発明が解決しようとする課題】本発明が解決しようとする課題は、鍛造成形の加圧方向と略直角方向に貫通孔を有する鍛造品の製造において、メタルフローの接合部においても充分な強度と信頼性が得られる鍛造方法の提供にある。

【０００６】

【課題を解決するための手段】本発明が上記課題を解決するために講じた手段は、キャビティ内に鍛造品に貫通孔を形成するための貫通孔形成ピンを摺動可能に設けるとともに、当該貫通孔形成ピンに対してメタルフロー下流に余肉成形隙を設けて、素材投入量を所定の鍛造品に適量の余肉形成分を加えたものとしたものである。

【０００７】以下、製造工程順に説明すると、キャビティ内に素材を投入し、上金型に取り付けられたパンチにて加圧すると、素材はキャビティ形状に合わせて変形し、素材メタルは貫通孔形成ピンに当たるとメタルフローが分断され、さらに加圧が進むと当該貫通孔形成ピンを包み込むように流れ、接合面が形成される。

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【０００８】この状態にて鍛造成形を終了すると、接合面に素材の表面に生じていた酸化皮膜等が介在することになるが、本発明においては、さらに加圧を続け、下金型に設けた余肉成形隙にメタルフローさせるものである。

【０００９】これにより、上記接合面の介在物が余肉部分に形成されることになる。その後に、貫通孔形成ピンをキャビティ内から摺動、抜き取りノックアウトピンにて鍛造品を金型から取り出し、余肉部分をプレス等にて除去することで、目的とする鍛造品を得ることになる。

【００１０】ここで、余肉部分の大きさは、製品形状に合わせて適宜設定することになるが、図２に示した実施例の場合には、ヨーク耳片の製品端から貫通孔端までの寸法ａ以上に余肉長さａを設けることが望ましい。

【００１１】また、鍛造品素材としてアルミニウム合金を採用する場合には、成形温度を３５０～４５０℃が良く、望ましくは、３８０～４２０℃が良い。

【００１２】３５０℃未満では成形性が悪くなり、４５０℃を超えるとアルミニウム素材表面の酸化皮膜が厚くなり、接合面での破壊、除去が困難になり、貫通孔の強度が低下する恐れがあるからである。

【００１３】また、素材への潤滑剤塗布量も適宜選定されるが、極力少なくした方が良い。

【００１４】

【発明の実施の形態】本発明の実施の形態を添付図面に基づいて以下説明する。

【００１５】図１に金型の模式図を示すが、下金型２にはキャビティ６が設けられ、貫通孔形成ピン５１、５２が摺動可能に嵌動部９に連結されている。

【００１６】また、キャビティ下部には余肉成形隙７およびノックアウトピン８が配設されている。

【００１７】一方、上金型１にはパンチ３が設けられている。アルミニウム合金素材４をキャビティ内に投入し、上金型を下降させ、パンチにて鍛造成形した。

【００１８】本実施形態における鍛造品の形状例を図２に示すが、接合部長さａ＝４．５ｍｍであるために、余肉長さａ＝４．５ｍｍ以上、余肉厚さ３ｍｍ、余肉幅６ｍｍに設定した。

【００１９】その後に、貫通孔形成ピンを嵌動部を作動させて製品部より抜き、ノックアウトピンを上昇させて製品を取り出した。

【００２０】得られた製品を次のような条件にて強度評価した結果を図３に示す。

【００２１】［試験方法］本実施形態における鍛造品の胴部を固定し、両孔部に貫通するピンを挿入し、余肉成形方向と略直角方向にピンを回転させ、接合部の破断強度を求めた。

【００２２】［条件］Ｔ６処理後、余肉部を切断除去し、目標強度４５０Ｎ・ｍ以上に対し、最大測定値を５００Ｎ・ｍに設定して、試験を実施した。

【００２３】尚お、比較のために成形温度、余肉長さを変化させた場合も同様に、図３に示した。

【００２４】

【発明の効果】本発明によれば、加圧方向に対して略直角方向に貫通孔を有する鍛造品の場合にてもメタルフローの接合面の酸化物、潤滑剤等の介在物が除去でき、強度、信頼性に優れた鍛造品を得ることができ、従来のよ＊うに孔部の機械加工が省略できるとともに、材料費の低減に寄与できる。

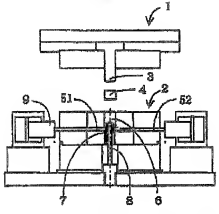
【図面の簡単な説明】

【図１】本発明における金型の模式図を示す。

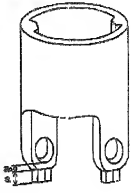
【図２】水発明にて得られた製品の形状例を示す。

【図３】鍛造品孔部の強度結果を示す。

【図１】



【図２】



【図３】

例	成形温度	余肉長さ	接合部強度
1	400℃	5mm	500N・m以上
2	450℃	7mm	160N・m
3	450℃	21mm	500N・m以上
4	500℃	11mm	280N・m